

TESTING AND ACCEPTANCE OF STEEL REINFORCING BARS
(UNCOATED AND EPOXY COATED)

1. SCOPE:

- 1.1. The Kentucky Transportation Cabinet's (KYTC) acceptance procedure for uncoated, deformed steel reinforcing bars requires "heat"* sampling, testing, and certification of test results for all heats. Certification of test results is defined as a test report containing actual per heat results and signed by the person in charge of testing. Certified test results may only originate from manufacturers included on the Division of Material's (Division) current List of Approved Materials (LAM) . The certified test results shall be submitted to the Division prior to shipment of bars to KYTC projects by either manufacturers, fabricators, or epoxy coaters included on the LAM.

The KYTC's acceptance procedures for epoxy coated deformed steel reinforcing bars requires certification of all bars prior to coating. The epoxy coating shall be applied only by epoxy coating applicators included on the LAM.

*The word "Heat", as used herein, is synonymous with "Test Identification Number" when the material referenced is rail or axle steel.

2. MANUFACTURER'S RESPONSIBILITIES:

- 2.1. Gaining LAM Status: Reinforcing steel manufacturers desiring to be included on the LAM shall abide by all requirements listed herein. The manufacturer shall submit a Quality Control Program to the Division. For a Quality Control Program to be acceptable it must meet the following criteria:
- 2.1.1. Testing equipment shall be tested and calibrated by an approved independent company at least annually and a copy of the certification submitted to the Division.
 - 2.1.2. A Quality Control Inspector shall perform all tests and inspections as required in section 2.3.
 - 2.1.3. Identity of heats shall be maintained from melting pot to delivery to fabricator, epoxy coater or the jobsite.
 - 2.1.4. Records of test results shall be available for inspection for five years.
 - 2.1.5. A certified mill test shall be furnished with each shipment of steel. The certified mill test shall contain the results of all applicable ASTM tests on a per heat basis: that is; nominal weight, yield and tensile strength, elongation, 180° bend test, height of

deformations and phosphorous content.

2.1.6. Reinforcing steel shipped directly to the jobsite by the manufacturer shall meet the requirements of section 2.2. and section 3.

2.1.7. The manufacturer shall participate in an annual cooperative test program with the Division as described in section 2.4.

2.2. Heat Identification Requirements: The fabricator or manufacturer shall provide a definite means whereby the various heat numbers in each shipment can be positively identified and, if necessary, separated from the remainder of the shipment. Individual bundles of bars shall be identified by tags or other acceptable means and tied into sub-bundles as necessary to provide positive heat identification. Form TC 64-122 (See attached example) shall be completed in duplicate with one copy to accompany the shipment and be presented to the Project Engineer and one copy mailed directly to:

Physical Section
Kentucky Division of Materials
1227 Wilkinson Boulevard
Frankfort, Kentucky 40601-1226.

Form TC 64-122 and envelopes for jobsite copies will be furnished by the Division.

2.3. Testing And Acceptance Criteria:

2.3.1. General:

2.3.1.1. All testing shall be performed in accordance with standard ASTM procedures. Manufacturers shall have their testing equipment calibrated at least annually and copies of the calibration results shall be furnished to the KYTC. Additionally, annual cooperative testing shall be performed by the KYTC and the manufacturer. Samples shall be submitted prepaid by the manufacturer.

2.3.1.2. Bar properties to be tested are yield strength, tensile strength, elongation, 180° bend, weight per foot, deformations and phosphorus content. The manufacturer shall provide chemical, mechanical and physical properties for each heat being considered for approval. Strength results will be rounded to the nearest 1000 psi and recorded as such.

2.3.1.3. The failure of any property of any test specimen shall be cause for rejection of the heat.

2.3.1.4. When either passing or failing results from a specimen can be definitely attributed to a known testing error, such results shall be disregarded and additional samples shall be taken as necessary to

comply with the above criteria.

2.4. Cooperative Testing:

2.4.1. Samples for ASTM A 615 cooperative testing shall consist of ~~10-20~~ bars (2 bars per heat) from 10 different heats (if possible) 60" in length, representing each bar size produced up to and including a #11 (36 mm) bar. If the number of bar sizes produced are fewer than 10, make up the difference with whatever bar size you wish but include 10 different heats (if possible). If the cooperating facility also produces ASTM A 706 steel, provide two additional samples for each of these sizes as well with as many different heats represented as possible.

2.4.2. Cooperative testing shall consist of the following test data: YIELD in pounds per square inch, TENSILE in pounds per square inch, ELONGATION in percent, and WEIGHT in pounds per foot. Each bar will be submitted to the appropriate bend test as well. ~~nominal weight (pounds per foot), yield, tensile, 180° bend, and elongation tests.~~ The methods of tests shall be in accordance with ASTM A 615, A 955 and/or A996 as appropriate. Submit test data from the cooperating facility for the above parameters on the heats of steel represented by the samples and provide actual weight/length [lb/ft] of the samples tested at your facility. Indicate what bar sizes the mill produces, what type steel (A 615 or A 706), and if the samples are of coil or straight stock. Also submit a copy of the most recent calibration/certification on your tensile equipment.

2.4.3. The average test results for the same heat and bar size run at each laboratory shall not vary more between laboratories than the following:

Pounds Per Foot	± 1 Percent
Yield	± 4 Percent
Tensile	± 4 Percent
Elongation	± 3 Percent

2.4.4. Any heat failing to meet section 2.4.3 may be resampled. The resampling shall consist of three bars from the same heat.

2.4.5. At least 90% of comparable test values must be within the limits of section 2.4.3 to obtain or continue LAM status.

2.5. Removal From LAM: Maintaining LAM status will be contingent upon compliance with all requirements contained in this section and section 5.

3. FABRICATOR'S RESPONSIBILITIES:

3.1. Gaining LAM Status: Fabricators desiring to be included on the LAM shall abide by all applicable requirements listed herein.

3.1.1. Purchase reinforcing steel from a manufacturer or epoxy coater on the LAM

maintained by the Division. Submit copies of the Certified Mill Tests to the Division before shipment to the jobsite.

3.1.2. Identity of heats shall be maintained at all times and documentation shall be provided as required in section 2.2. Epoxy coated reinforcing steel shall also be accompanied by copies of all documentation provided by the epoxy coater.

3.2. Removal From LAM: Maintaining LAM status will be contingent upon compliance with all requirements contained in this section and section 5.

4. EPOXY COATER'S RESPONSIBILITIES:

4.1. Gaining LAM Status: Epoxy coaters desiring to be included on the LAM shall abide by all requirements listed herein. The epoxy coater must agree to abide by the current edition of Kentucky Standard Specifications for Road and Bridge Construction (Specifications) (specifically section 811.10) and obtain approval of his Quality Assurance Program from the Division. For the Quality Assurance Program to be acceptable, the epoxy coater must, as a minimum, comply with the following:

4.1.1. All reinforcing steel for coating shall be from a manufacturer on the LAM maintained by the Division.

4.1.2. Identity of heats shall be maintained at all times as required in section 2.2.

4.1.3. Use only epoxy powder shown on the LAM. A written manufacturer's certification for this resin shall be submitted annually to the Division.

4.1.4. Perform the following quality functions (KM 64-102) and record test results:

4.1.4.1. Monitor blast cleaning operations at least every two hours to insure conformance to pictorial standards A Sp 10, B Sp 10, or C Sp 10 of SSPC Vis 1 and to maintain proper etch pattern.

4.1.4.2. Insure that bars are epoxy coated within 8 hours after blast cleaning.

4.1.4.3. Check temperature of bar just prior to coating to insure powder manufacturer's application temperature is met.

4.1.4.4. Check daily to insure that the minimum curing time recommended by the powder manufacturer has elapsed prior to the coated bars reaching the water bath.

4.1.4.5. Check the coating thickness with a thumb wheel pulloff gauge. The thickness gauge will be calibrated for accuracy at least daily and the results recorded on the quality control report. The thickness will be measured according to ASTM A 775 with the following exception: instead of a minimum of five recorded measurements on each side of

the bar, a minimum of three recorded measurements will be taken on each side of the bar (a measurement is the average of three individual readings obtained between three consecutive deformations). The coating thickness shall be 7 to 12 mils. Thickness measurements will be taken as often as necessary, but at least one bar from each 60 minutes of production time shall be documented. If the coating on the bar checked does not meet the thickness requirements, that bar shall be rejected and additional bars (usually adjacent to the original test bar) shall be checked to determine the extent of the problem. Either an insufficient or excessive film thickness will be cause for rejection of the coated bars.

4.1.4.6. Check for Continuity of Coating:

4.1.4.6.1. After curing, check all coated bars visually for defects in the coating such as holes, voids, delaminations, contamination, and damaged areas.

4.1.4.6.2. Check at least one bar from each 30 minutes of production time. (Pinholes in the coating not visible to the naked eye) with a 67 Ω volt holiday detector.

4.1.4.6.3. When any bar has more than two defects and/or "holidays" per linear foot or a total defective area exceeding 0.25 percent of the surface area per linear foot, the defects and/or "holidays" shall be repaired with approved touch-up material. When any bar has more than five defects and/or "holidays" per linear foot or a total defective area exceeding 0.5 percent of the surface area per linear foot, the bar shall be rejected. When any bar is found that requires touch-up or rejection, additional bars (usually adjacent to the problem bar) shall be checked to determine the extent of the problem.

4.1.4.7. Check the flexibility of the coating by bending one bar of each size coated per shift, but with a minimum of two tests per eight hour shift. The bars are to be bent around a pin equal in diameter to the bar size in inches as per ASTM A 775 Table I. Bend the bar at room temperature through an arc of 180° after rebound. The coating should not show any visible cracks.

4.2. Documentation: Shipments of epoxy coated bars to projects shall be accompanied by a TC 64-122. A copy of the following shall be mailed to the Division at the address given in section 2.2: (A) A duplicate copy of the TC 64-122, (B) Certified Mill Test Reports, (C) A Certificate of Compliance containing verification of specification testing for the coated bars, (D) A copy of the quality control test results (see attached example) and, (E) A statement that all test results meet the requirements of the Specifications. The Division will verify heat approval, review the certificate of compliance and then grant approval of epoxy

coated reinforcing bars.

- 4.3. Removal From LAM: Maintaining LAM status will be contingent upon compliance with all requirements contained in this section and section 5.

5. CONDITIONS FOR REMOVAL FROM LAM:

- 5.1. The following conditions will result in probation or removal from the LAM:

5.1.1. Failure to comply with the minimum criteria for each approved list.

5.1.2. Frequently recurring instances of check sample failure.

5.1.3. Inclusion of unapproved heats or grades in shipments.

5.1.4. Lack of sufficient heat identification.

5.1.5. Furnishing of non-specification material.

- 5.2. Once a manufacturer, fabricator or epoxy coater is removed from an approved list reinstatement may be requested after a period of three months, providing the reason(s) for removal is (are) recognized and corrected.

6. KYTC JOBSITE SAMPLING AND TESTING:

- 6.1. General: Deformed steel reinforcing bars (coated or uncoated) will be check sampled from the jobsite at a frequency of one sample ~~from each heat totaling per 2030,000 lb.~~ for plain, and one sample ~~from each heat totaling per 1025,000 lb.~~ for epoxy coated ~~for each day's delivery.~~ Samples will be tested by the Division.

6.1.1. A sample shall consist of one bar 60 inches in length chosen at random from the bars within the heat. If different size bars are manufactured from the same heat, obtain a sample of each bar size.

6.1.2. Each sample shall be clearly identified as to heat number.

6.1.3. Steel bars which have been pretested and certified by an approved manufacturer may, at the contractor's option be used in the work prior to obtaining results from the aforementioned check tests. However, when all or a portion of a shipment is verified by check tests to be out of specification tolerance, or not of the specified grade or type, any unused portion of the heat(s) on any project will be rejected. Any portion which has been used will be subject to removal, corrective measures or acceptance with a deduction as deemed appropriate by the KYTC.

- 6.2. Testing Of Jobsite Check Samples:

6.2.1. Plain and Epoxy Coated Steel: All six mechanical test properties listed in 2.1.5 shall

be performed on each sample. It is anticipated that minor variations in test results between pretested and certified heats and check samples of the same heat will occur. Therefore, test results obtained from jobsite check samples will be considered acceptable if they are not more than 3% less than the specified values. The one exception is nominal weight, which may not vary more than the specified 6% of the nominal value.

- 6.2.2. Epoxy Coated Steel: In Addition to 6.2.1, thickness of epoxy coating will be measured according to ASTM A 775 with the following exception: instead of a minimum of five recorded measurements on each side of the bar, a minimum of three recorded measurements will be taken on each side of the bar. For a referee test ASTM A 775 will be strictly followed.

APPROVED _____
Director
DIVISION OF MATERIALS

DATE 01/04/05-05/04/06

Kentucky Method 64-101-~~05~~06

Revised ~~01/04/05~~05/04/06

Supersedes 64-101-~~03~~05

Dated ~~2/21/03~~1/4/05

Attachments

~~km10105~~km10106.doc

**FABRICATOR'S HEAT NUMBER IDENTIFICATION
OF REINFORCING BARS**

County _____ Project Number _____

Supplier _____ Supplier Number _____

Bar List Number(s) _____ Fabricator _____

Drawing Number _____ Station _____ Contractor _____

The following table lists heat numbers and mill marks so that each heat number involved may be positively identified and separated, if necessary, at destination.

BAR LIST OR ORDER NO.	BAR TYPE OR MARK	BAR SIZE	GRADE	WEIGHT (Lbs.)	MANUFACTURER (Mill Mark)	HEAT NO.

I certify that all the heats listed above and contained in this shipment meet the requirements of the current Kentucky Method 64-101 and Kentucky Standard Specifications section 811.02. Manufacturer's certified test results have been furnished to the Division of Materials.

Date _____

Signature of Authorized Representative

Load _____ of _____

QUALITY CONTROL REPORT

(COMPANY NAME)

I GENERAL INFORMATION -

COUNTY _____ PROJECT _____
Epoxy Lot No. _____ Date _____
Type Epoxy Used _____ Mfg.'s Cert. of Epoxy Powder _____
Bar Size(s) _____ Pretested Heat No.(s) _____
Rebar Supplier _____ Fabricator _____

II REQUIREMENTS PRIOR AND DURING APPLICATION OF EPOXY COATING -

Blast Cleaned to Conform to pictorial standards A Sp 10, B Sp 10, or C Sp 10 of
SSPC Vis 1 _____
Bars coated within 8 hours of blast cleaning _____
Bars at epoxy manufacturer's recommended temperature _____ °C (°F.) to _____ °C (°F.)
1) _____ °C (°F.) 2) _____ °C (°F.) 3) _____ °C (°F.)
Curing time from leaving coating chamber until arrival at water bath _____ seconds

III REQUIRED PROPERTIES OF COATED BARS -

Thickness gauge calibration standard _____ mils. Today's reading _____ mil
Coating thickness, one sample from each 30 minutes of production time will be tested, 7 to 12 mil.
Work sheet on page 2 _____

Check coated bars for no contamination, free from holes, cracks, and damaged areas. One bar will be tested from each 30 minutes of production time with a visual scanning of the other bars.

Holidays, maximum of two per 2 per foot, one sample from each 30 minutes of production time shall be tested.

Work sheet on page 2 _____

Bend test will be taken on one bar of each size per 8 hour shift, but with a minimum of two. Bend 120° around required pin 20°C (68°) - 29.4°C (85°F) 1) _____ 2) _____

IV GENERAL REQUIREMENTS AFTER COATING -

All damaged areas repaired within 24 hours _____
Bundles of coated bars tied with protective materials _____
Bundles loaded on trucks with caution and protective dunnage _____

Inspectors Signature

EPOXY WORKSHEET

Heat No. _____

Date _____
 Powder Manufacturer _____
 Powder Lots Used _____,
 _____,

Temp. _____ °

[illegible]